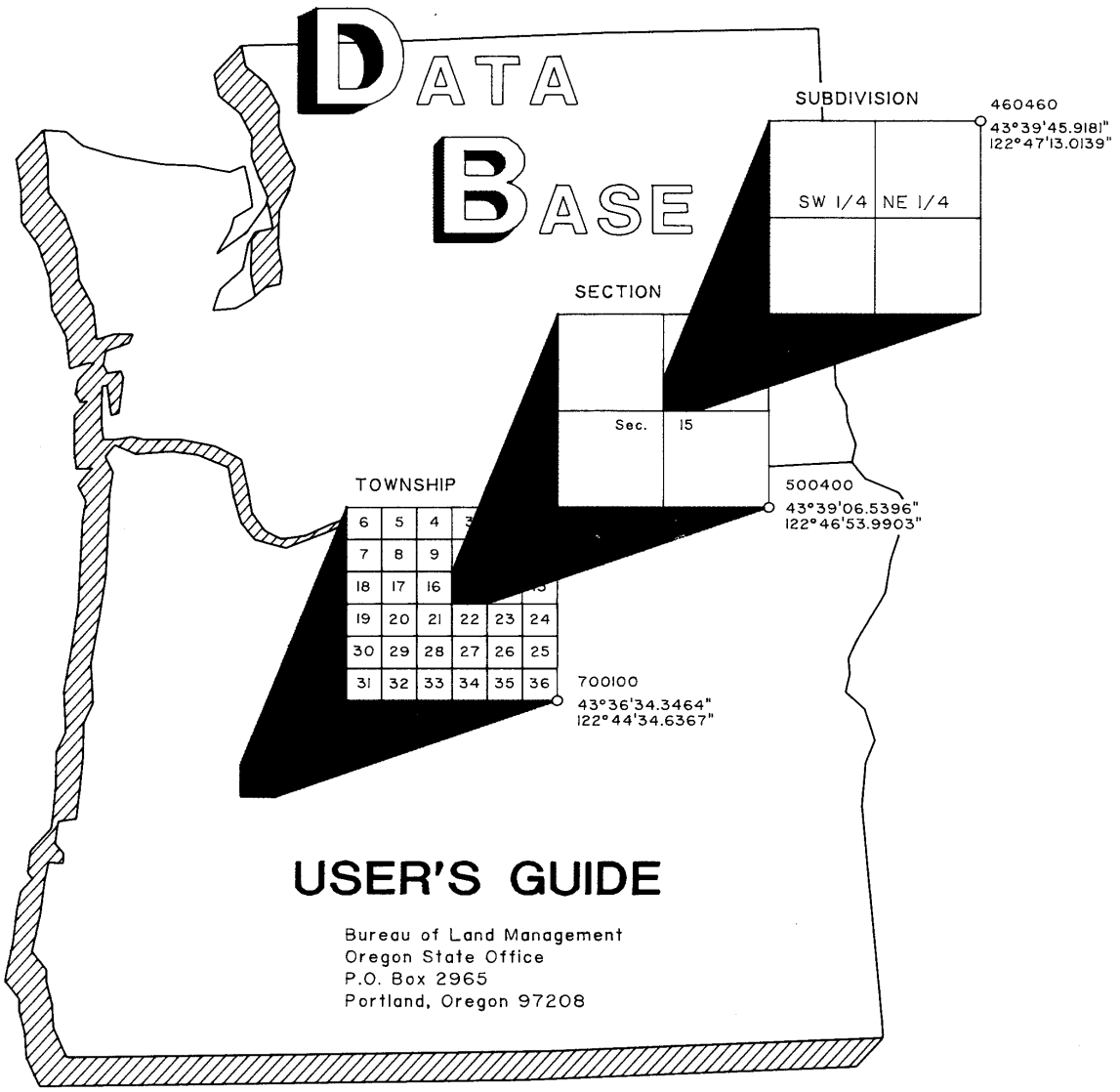
GEOGRAPHIC COORDINATE DATA BASE



USER'S GUIDE

Bureau of Land Management
Oregon State Office
P.O. Box 2965
Portland, Oregon 97208

INTRODUCTION

The geographic coordinate data base (GCDB) is a data base containing geographic coordinates, and their associated attributes, for all corners of the Public Land Survey System (PLSS). It is being developed and funded by the Bureau of Land Management for the purpose of automating current manual land records processes. In cooperation with State and local governments, the BLM Oregon State Office is populating the GCDB with the best coordinate values possible in the initial collection phase; however, the positional accuracy of the coordinates will vary dependent on the quality of the data used. The GCDB can serve as the foundation or framework that all users within the State will add to for their own specific needs.

There are three general requirements for the GCDB within the BLM, the first is to support a spatially oriented graphic system that automates the production of Master Title and Use Plats; the second uses the geographic coordinates to relate legal land descriptions, ownership and status information to map-referenced points on the earth's surface; the third is to provide the limits, or boundaries, for resource data collection.

The geographic coordinates and their associated products have NO legal significance. They should be used for record keeping, mapping, graphics, and planning purposes only.

Coordinates to be computed

1. All rectangular corners down to the 1/1 6 section corners.
2. All special survey corners and angle points (DLC, meanders, mining claims, HES, etc.).
3. All subdivision of section corners down to the 1/1 6 section corners or to the level that the Master Title Plat dictates.

Data Sources for GCDB

Survey Data

1 .Bureau of Land Management
2. U.S. Forest Service
3. County Surveyors Office
4. U.S. Fish and Wildlife
5. U.S. Bureau of Reclamation
6. U.S. Army Corps of Engineers
7. Oregon State Highway Department
8. Bonneville Power Administration
9. Private Utility Companies

Control Data

1. Bureau of Land Management
2. U.S. Forest Service
3. U.S. Geological Survey

4. U.S. Army Corps of Engineers
5. NGS/NOAA
6. Bonneville Power Administration
7. Oregon State Highway Department
8. Oregon State Department of Revenue
9. County Surveyors Office
10. Private Utility Companies
11. Local Municipalities

There is no "standard' per se for the survey and control data. Simply put, we will use whatever works best.

The abstraction process clears up any ambiguities in the survey records, clearly identifies the correct spatial relationships between corners, shows the class of survey, the type, quantity, and location of control, and determines the correct parenthetical distances to be used for lotting proportioning.

RAW Data File Contents (R-File, or .RAW extension)

Most reliable bearing and distance between corners or points, and a numerical source document code.

The township abstraction data is transferred to 1: 100,000 scale maps to afford the surveyors doing the adjustments a wider view of where the better survey and control exists. The approach we take is similar to that of a first, second, and third order adjustment done for horizontal and vertical control surveys. The best data is adjusted first and held as control for the subsequent adjustments.

Information Collected in Final File (LX-file, or .LX extension : Points and Lines)

1. Six digit point identification number
2. Latitude and Longitude (NAD 27)
3. Reliability (see attached sheet)
4. Graphics (pen) instructions
5. State Plane or UTM coordinates

Additional Records Compiled

Statistical information on assigned reliabilities, based on comparisons of GCDB computed coordinates with field generated coordinates, either through GPS or conventional survey methods.

Descriptions and examples of the R-File, Z-file, and the LXGCF file are included in this User's Guide. We can't promise you that the data is flawless. Let us know if you find any problems; this will help us improve the quality of the data base. If you have any questions about anything, give us a call, 503 952-6151.

CAVEAT

The geographic coordinates, and their by-products, were generated from either Public Land Survey System Coordinate Computational Software (PCCS) using official Public Land Survey System (PLSS) records (and when deemed necessary, State, County, and private survey records) or digitized coordinates from various cartographic and photographic products. Except where a corner monument has been used as a first or second order control point and the results are of public record, the coordinate values used by GCDB are established with varying reliability based on the source material and method of data input. These coordinate values will be updated as better data and methodology are available. Graphic representations using these values depict the most probable township configuration and may change as a result of such updates.

The geographic coordinates and their associated products have NO legal significance. They should be used for record keeping, mapping, graphics and planning purposes only.

No warranty is made by the Bureau of Land Management for use of the data for purposes not intended by BLM.

CONTROL and RELIABILITY

To avoid some confusion it is probably a good idea to explain how the term “control" is used in GCDB. Control is the term we use to describe a PLSS corner that has had coordinate values attached to it by some physical means, i.e., aero-triangulation via aerial photography, conventional survey ties to horizontal control (triangulation stations), GPS observations, or digitized from USGS 7-½ minute topographic quadrangle maps (recovered PLSS corners indicated with a bold tick). The control coordinates’ accuracy or "reliability" will vary dependent on the method by which they were obtained, so we have assigned reliability codes to ranges of expected accuracy both for control coordinates and computed coordinates (see following sheet for codes and ranges).

Reliability, then, is a term used to express the expected positional accuracy, relative to the earth's surface. As surveyors we use our professional judgement in the field to interpret evidence and we exercise that same professional judgement in gathering the input data, and interpreting the computations that result. Since we are gathering survey measurements from every conceivable source we must first determine that the data we will use is the most accurate in ground and angular measurements, that correct survey procedures have been followed in reestablishing lost corner positions, and that we have a common basis of bearing. In assigning reliability codes to computed coordinates, we will look at the control reliability at both ends of a traverse (or network), the closure reports of the traverse (or network) between the control, and including what we know of the technology available to-- and the skill of -- the surveyors whose measurements we are using.

COORDINATE RELIABILITY

Code	Reliability	
1	1 foot or less	
2	3 feet or less	
3	10 feet or less	
4	40 feet or less	Supports USGS and USFS with a cutoff at the National Map Accuracy Standard for 7-½ minute maps.
5	100 feet or less	
6	200 feet or less	Supports USGS when PLSS lines are depicted by dashed lines.
7	Over 200 feet	Supports USGS when PLSS lines are not depicted.
8	Possibly fraudulent	

CONTROL RELIABILITY

Code	Reliability	
1	1 foot or less	First Order triangulation or GPS* stations
2	3 feet or less	Second- and third-order triangulation stations, Doppler positions, and some GPS* values.
3	10 feet or less	Photo-generated coordinates, survey ties to triangulation or GPS* stations, and Inertial positions.
4	40 feet or less	Digitized control from 7-½ minute Quadrangles, resource collection grade GPS* receivers.
5	100 feet or less	Digitized control from 15-minute quadrangles, resource collection grade GPS* receivers.

* Coordinate values obtained from GPS receivers will vary in accuracy and reliability depending on the methods of data collection and post processing utilized.

R-File (*or* **.RAW** file)

R-file - Contains Distance, Bearing, and Source ID, used to build traverse routes between known coordinates (control on PLSS corners), and generate geographic coordinates for the intervening points.

```
 TWP 23S RNG 12E PM WILL          OR          DATE 91/7/29
999999
700100    700140    40.000   4         0.   1
700140    700200    40.000   4         0.   1
700200    700240    40.000   4         0.   1
700240    700300    40.000   4         0.   1
700300    700340    40.000   4         0.   1
700340    700400    40.000   4         0.   1
700400    700440    40.000   4         0.   1
700440    700500    40.000   4         0.   1
700500    700540    40.000   4         0.   1
700540    700600    40.000   4         0.   1
700600    700640    40.000   4         0.   1
700640    700660    20.000   4         0.   1
700660    700700    17.000   4         0.   1
240200    200200    39.975   4    894800.   2
200200    140200    40.000   4    894300.   2
140200    120200    20.000   4    894300.   2
120200    100200    20.400   4    894300.   2
700300    640300    40.085   4    893600.   2
640300    600300    40.085   4    893600.   2
600300    540300    39.865   4    895300.   2
540300    500300    39.865   4    895300.   2
500300    440300    40.160   4    894200.   2
440300    400300    40.160   4    894200.   2
|---------------------|    |-------|  |--|  |---------| |--|
          1                   2       3       4       5
```

1 - From and To station Point ID's
2 - Horizontal distance in chains
3 - Bearing quadrant 1 =NE, 2=SE, 3=SW, 4=NW
4 - Bearing in degrees, minutes, and seconds. The decimal is located after the seconds. Bearings refer to the true meridian (astronomic).
5 - Source Identifier number (SID). Each data source, whether it is an official cadastral survey plat, state or local survey plat, deed, etc., utilized in generating coordinates for the GCDB, will be assigned a unique (within the township) SID number. (See Z-file example)

Z-File (or **.SID** file)

TWP 14S RNG 15E PM WILL			OR	DATE 93/06/31
7	OR013	23-OCT-1984	02	TYE, J.R.
9	OR013	26-OCT-1917	02	UNKNOWN
11	OR013	06-OCT-1986	02	ARMSTRONG, D.B.
13	OR013	24-FEB-1988	02	ARMSTRONG, D.B.
20	OR013	01-NOV-1973	02	GRAVE, R.H.
25	BLM	19-OCT-1869	01	MELDRUM, J.
12	OR013	14-APR-1987	02	ARMSTRONG, D.B.
10	OR013	04-APR-1980	02	ARMSTRONG, D.B.
4	OR013	09-APR-1976	02	MANSFIELD, E.G.
3	OR013	01-JUN-1979	02	MANSFIELD, E.G.
1	OR013	21-DEC-1982	02	ARMSTRONG, D.B.
2	OR013	21-DEC-1982	02	HICKMAN, G.W.
8	OR013	06-MAR-1985	02	HOLLINGSWORTH, J.E.
26	OR013	16-NOV-1992	02	ARMSTRONG, D.B.
27	OR013	21-DEC-1982	02	HICKMAN. G.W.
17	OR013	01-JUL-1978	02	ARMSTRONG, D.B.
22	OR013	05-APR-1988	02	ARMSTRONG, D.B.
23	OR013	27-APR-1987	02	ARMSTRONG, D.B.
24	OR013	26-MAR-1981	02	ARMSTRONG, D.B.
1	2	3	4	5

1 - Source Identifier number (SID) Each source document that was used in the GCDB collection process will be assigned a unique SID. The SID is unique only to the township the file relates to.

2 - Source Identifier Agency. A code identifying the source of the survey document by agency. The code is explained in the Data Element Dictionary. See Attached Table A.

3 - Acceptance Date. For BLM and GLO plats this is the date the Surveyor General or Cadastral Branch Chief signed the plat. For private surveys it is the date when the plat was filed or recorded with the county.

4 - Survey Procedure. A Data Element Dictionary code number for the type of survey procedure used, e.g., original survey, dependent resurvey, etc. See Table B.

5 - Surveyor Name. The name of the surveyor who conducted the field survey or who signed the recorded plat.

TABLE A

Please enter the number for the Source Document Agency:
for the reference code 3507
DED9125

<1>-Atomic Energy Commission(AEC)
<2>-US Army Map Svc.(now DMA)
<3>-Bureau of Land Management(BLM)
<4>-Bureau of Reclamation(BOR)
<5>-Civil Aeronautics Board(CAB)
<6>-Coast & Geodetic Srvy(CGS)
<7>-Defense Mapping Agency(DMA)
<8>-Fed Aviation Admin(FAA)
<9>-Nat'l. Aeronautics & Space AD(NASA)
<10>-Nat'l. Bureau of Standards(NBS)
<11>-Nat'l. Geodetic Survey(NGS)
<12>-Nat'l. Park Service(NPS)
<13>-US Forest Service(USFS)
<14>-US Geological Survey(USGS)
<15>-USGS Eastern Mapping Ctr.(TJSGS-E)
<16>-Wisconsin Dept of Trans(WIDT)
<17>-Dane County Wisconsin(WI-025)
<18>-Local Survyr,Ind/Firm(LOCSUR)
<19>-Univ of Wisconsin-Madison(UWI)
<20>-Mark Hurd Aerial Srvy,INC(KMS)
<21>-Other (County Codes; e.g., OR024)

TABLE B

Please enter the number corresponding to the Survey Procedure desired:
for the reference code 3507
DED9127

<1>-Original Survey(01)
<2>-Dependent Resurvey(02)
<3>-Independent Resurvey(03)
<4>-Retracement Survey(04)
<5>-Amer Land Title Ass Srvy(05)
<6>-California Tract Survey(06)
<7>-International Boundary Srvy(07)
<8>-Not Surveyed-Digitized(08)
<9>-Not Surveyed-Protracted(09)
<10>-Not Surveyed-Scaled(10)
<11>-Reacquired Lands Survey(11)
<12>-Omitted Lands Survey(12)
<13>-Remeasurement Survey(13)
<Restoration Survey(14)
<15>-Location Survey(15)
<16>-Other-SrvyProcedNotDescribed(16)
<17>-Supplemental Plat(17)
<18>-Field Survey Travers(18)
<19>-Field Survey Triang(19)
<20>-Field Survey Trilat(20)
<21>-GPS,FGDC Rel Pos Std.(21)
<22>-GPS,Rel Position Netwrk(22)
<23>-GPS,Rel Position Rad(23)
<24>-GPS,Point Position(34)
<25>-GPS,Procedure unkwn(35)
<26>-Unknown-Srvy Procdr Unkwn(99)

LXGCF POINT and LINE FILE

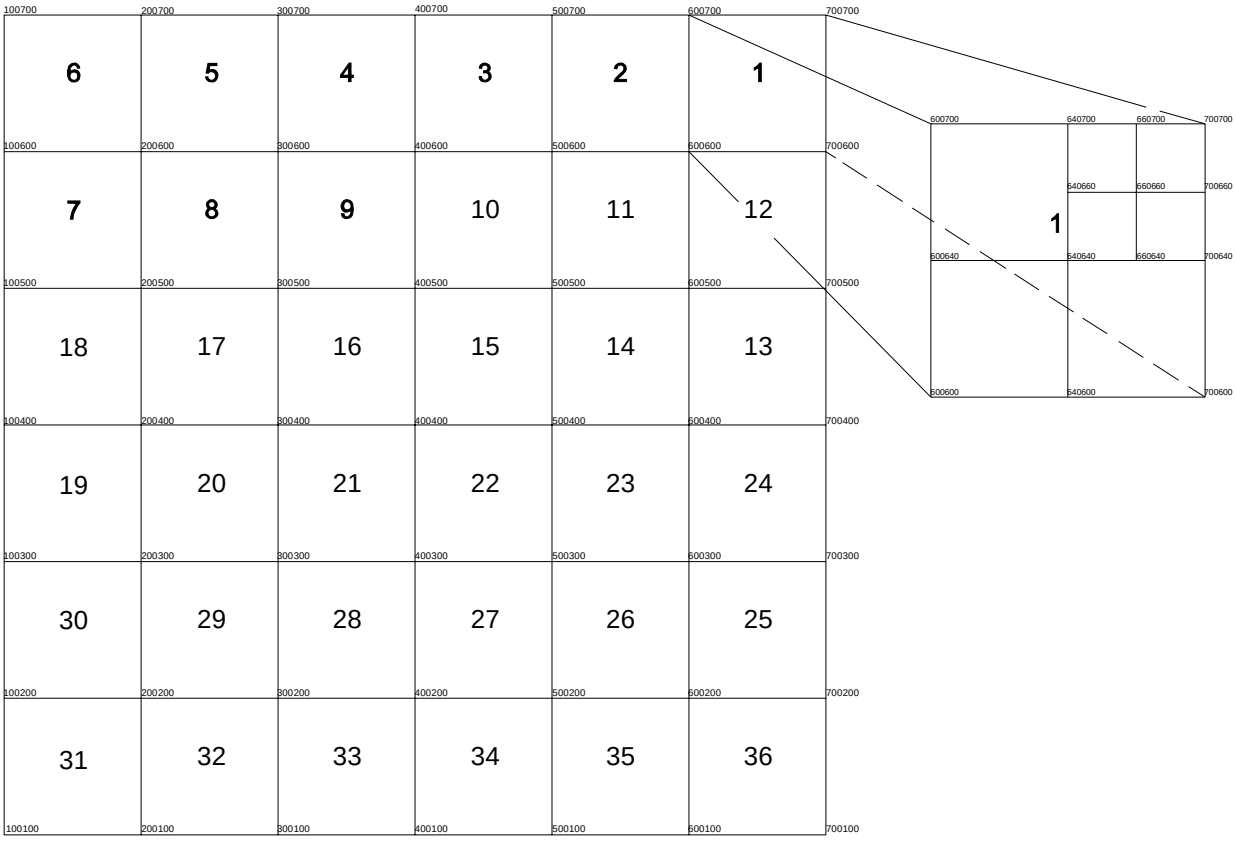
LX-file (or **.LX**)

LX-File - Contains Point ID, Latitude and Longitude, an approximate elevation for the township, Reliability Code, Maximum Closure of Traverse in Feet, Pen Instructions for Graphics, State Plane (or UTM) X and Y Coordinates.

```
TWP 23S RNG 12E PM WILL       OR          DATE 92/08/11
ORIGIN 433400.0000 1211600.0000      1.0 1.0000 1796807.96 693370.89
100100 433151.2031  1211955.1123  5400.00  4  40  1 0 2 1779369.92  680496.86
100120 433204.2153  1211955.0735  5400.00  4  40  1 0 3 1779385.87  681814.16
100140 433217.2274  1211955.0350  5400.00  4  10  1 0 3 1779401.79  683131.46
100160 433230.2639  1211954.9861  5400.00  4  40  1 0 3 1779418.50  684451.22
100200 433243.3004  1211954.9376  5400.00  4  40  1 0 3 1779435.19  685770.98
100220 433256.2851  1211954.7512  5400.00  5  58  1 0 3 1779461.97  687085.39
100240 433309.2699  1211954.5650  5400.00  5  58  1 0 3 1779488.74  688399.82
100260 433322.2546  1211954.3785  5400.00  5  58  1 0 3 1779515.53  689714.24
100300 433335.2394  1211954.1923  5400.00  4  40  1 0 3 1779542.30  691028.68
100320 433348.3475  1211954.2096  5400.00  4  40  1 0 3 1779554.20  692355.74
100340 433401.4557  1211954.2271  5400.00  4  30  1 0 3 1779566.09  693682.82
100360 433414.5638  1211954.2444  5400.00  4  40  1 0 3 1779578.00  695009.89
100400 433427.6719  1211954.2619  5400.00  4  40  1 0 3 1779589.89  696336.96
100420 433440.7127  1211954.2917  5400.00  4  40  1 0 3 1779600.81  697657.22
100440 433453.7536  1211954.3218  5400.00  4  27  1 0 3 1779611.71  698977.50
100460 433506.7943  1211954.3516  5400.00  4  40  1 0 3 1779622.63  700297.76
100500 433519.8353  1211954.3818  5400.00  4  40  1 0 3 1779633.52  701618.05
|-------| |--------------------------------| |---------| |--| |--| |-----| |-------------| |------------|
   1                  2                      3      4   5    6          7           8
```

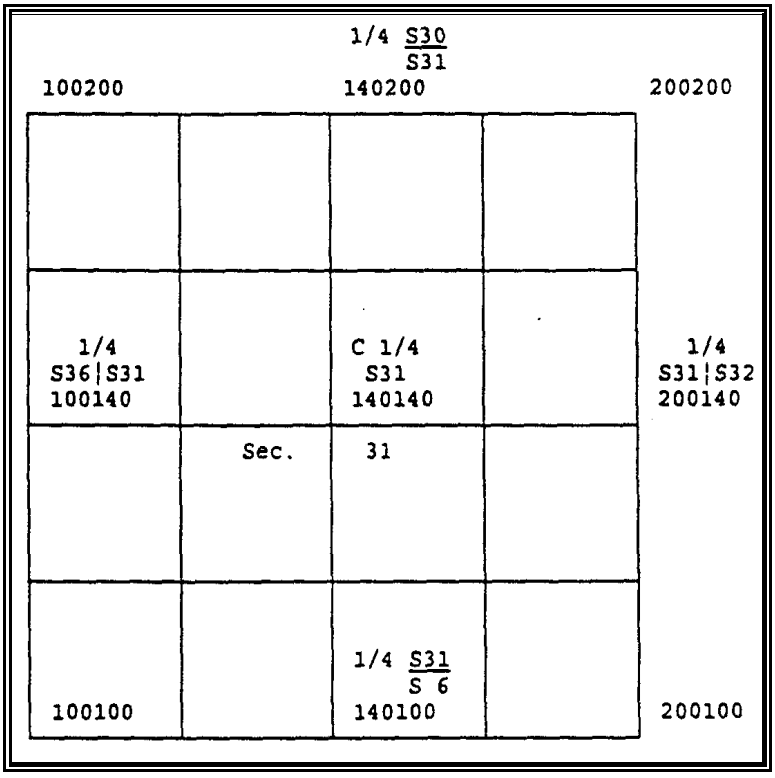
1 -Point ID
2 -NAD-27 Latitude and Longitude
3 -Scaled project elevation
4 -Reliability code
5 -Maximum misclosure of traverse in feet, or in the case of "control", this value will be the estimated circle of positional error.
6 -Pen instructions used in graphics software. The first field is line sequence, the second is line type (solid, dashed, etc.), the third is pen command: 1 = skip, 2 = pen down, 3 = draw, 4 = pen up
7 -State Plane coordinates, X value in feet
8 -State Plane coordinates, Y value in feet

GCDB POINT IDENTIFIERS



One-Quarter Section Identification

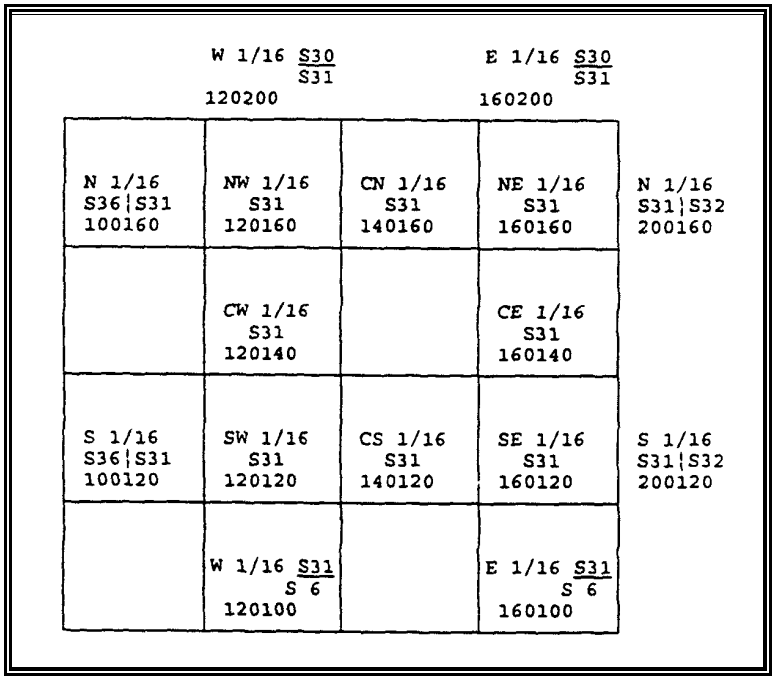
The previous set of point ID's can be utilized to define the four comers of specific sections within a township, but a further dissection is necessary if PLSS comers are to be identified, which were created in the subdivision of sections. The following diagram illustrates the point ID scheme used to identify 1/4 comers created in the subdivision of a standard section. Section #31 will be used to demonstrate this strategy:



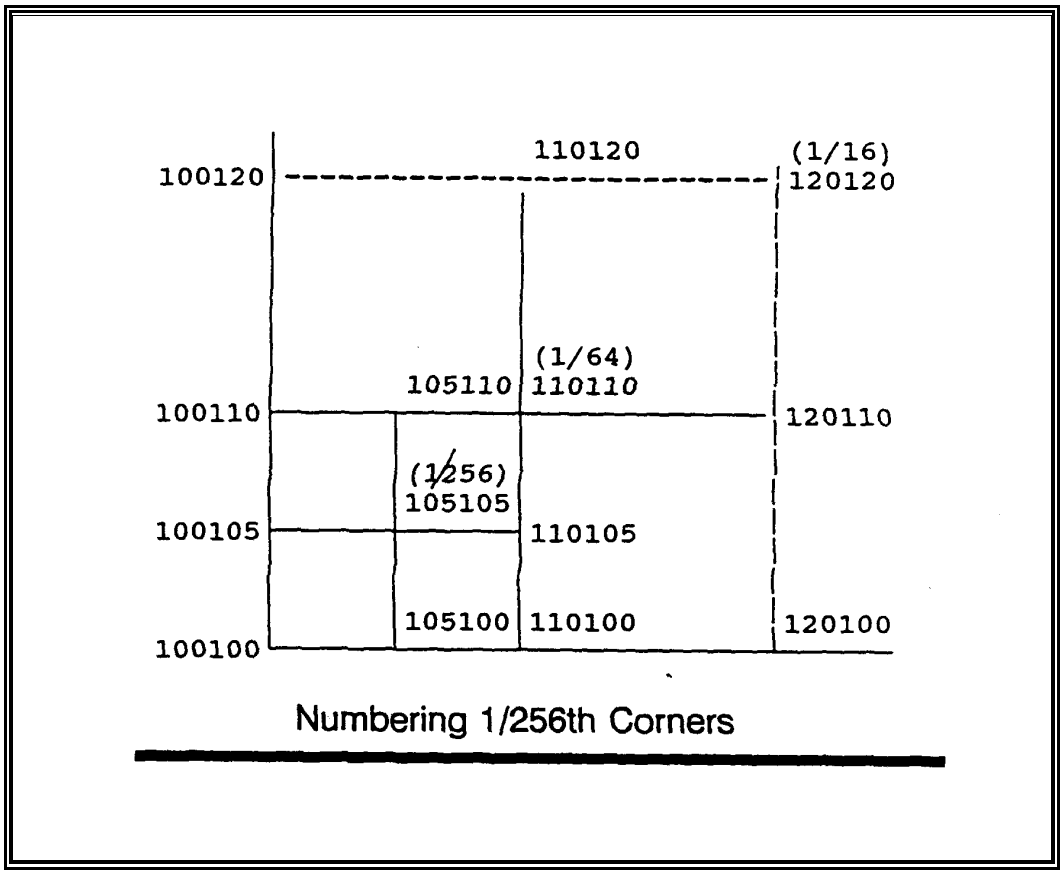
The User will notice that the four 1/4 corners are located between respective section corners, and that the 1/4 corners that fall on the East-West lines are identified with the Prefix 14OXXX, while the North-South lines have 1/4 corners that are identified by a Suffix of XXX140.

One-Sixteenth Section Identification

The following diagram illustrates the point ID scheme used to identify 1/16 comers created in the subdivision of a standard section. Section #31 will be used to demonstrate this strategy:



The next division identifies 1/16 corners located between respective 1/4 corners or between 1/4 corners and Section corners. Notice that the south 1/1 6 corner on the west boundary of section 31 is identified with the Suffix of XXX120, while the west 1/1 6 corner on the south boundary of section 31 is identified with a Prefix of 12OXXX. Further subdivision of sections below the 1/1 6 section corner level is possible using the same point identification strategy.



Numbering 1/256th Corners

Township Interior Point Identifiers
Non-Standard Rectangular

For double 1/4 section corners (examples A, B, C and D), the corners for the sections to the North and to the West will always have the standard point identifier, this includes all other aliquot part corners in this situation. In examples A and B, the non-standard and standard point identifiers begin at 200400 and must progress sequentially to 300400 (i.e., A 218400, 220400, etc.). Likewise, examples C and D must progress from 400100 to 400200 (i.e., D 400118, 400120, etc.). In double section corner situations (examples E through L), the closing corner would be given the non-standard number.

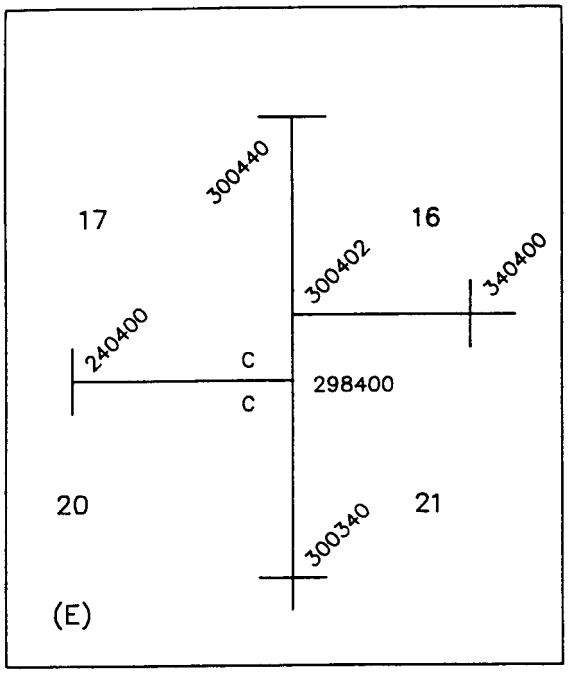
To develop the point identifier for triple section corners, and any other situation not shown here, keep in mind that the graphics program will look at each line, either N-S or E-W, as a whole. For example, in building the E and W 400 line, the program will first look at the last three digits of the point identifiers. Any it finds that are within the value of 2 from the nominal 400 (i.e., 398, 399, 400, 401 and 402) will be captured and placed in a file. The program will then sequence the contents of the file

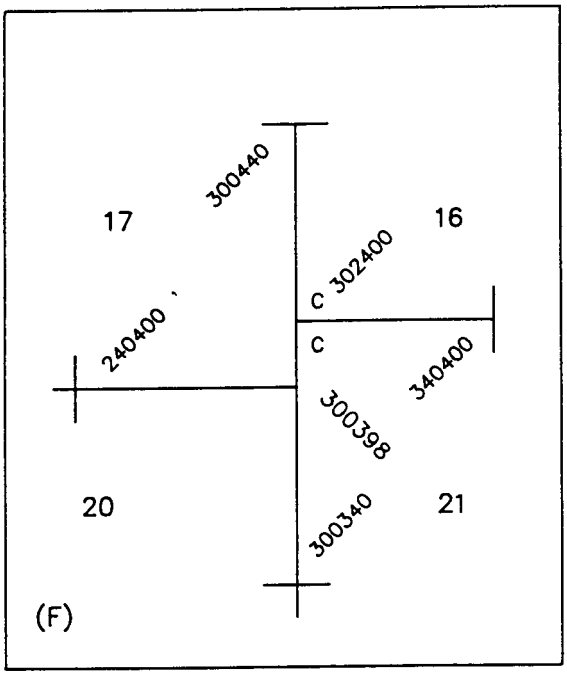
according to the numerical order of the first three digits of the point identifier. The resulting file then defines which points the E-W line will connect through.

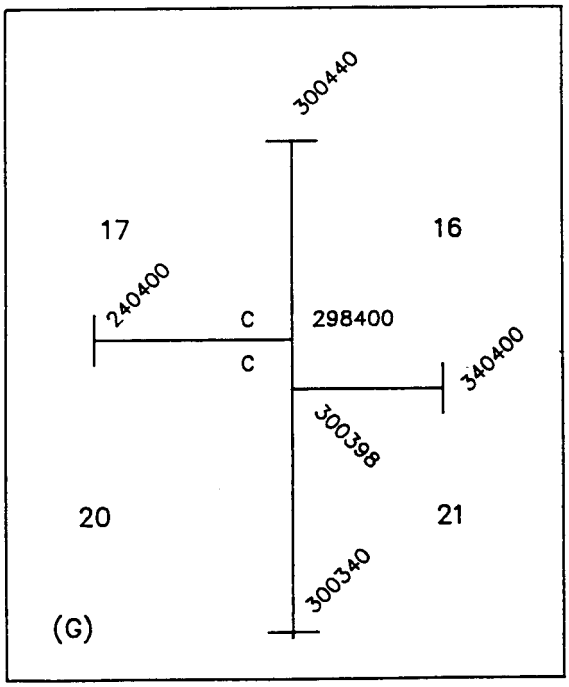
For a N and S example, look at the 300 line. The program will first look at the first three digits of the point identifiers, any numbers that are within the value of 2 from the nominal 300 (i.e., 298, 299, 300, 301 and 302) will be captured and placed in a file. The program will then sequence the contents of the file according to the numerical order of the last three digits of the point identifier. The resulting file then defines to which points the N and S line will connect.

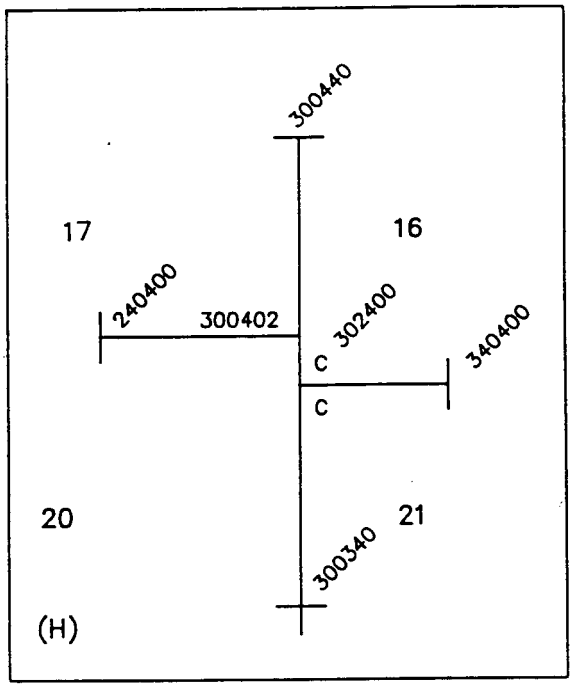
There is one very important rule to remember when constructing the non-standard point identifiers, as shown in examples Q and R, point 300397 should not be picked up during the E-W capture phase, that is why the last three digits are beyond the value of 2 from the nominal 400. In example S, point 297398 will not be picked up in the N-S capture phase, and in example T, point 303400 will not be picked up in the N-S capture phase.

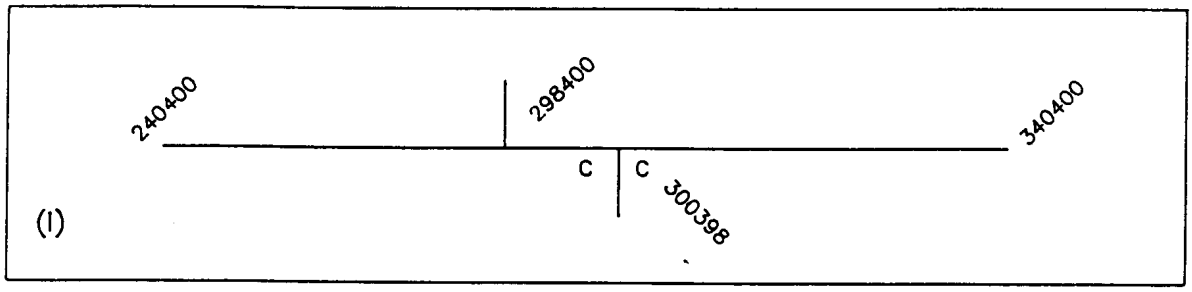
For most situations, sequential numbering will provide the solution. The point identifier, a six-digit number, is constructed of two three-digit sets. The first three digits pertain to the East and West direction only, and must progress from the West boundary of the township in ever increasing values to the East boundary of the township. The second three digits of the point identifier pertain to the North and South direction only, and must progress from the South boundary of the township in ever increasing values to the North boundary of the township.

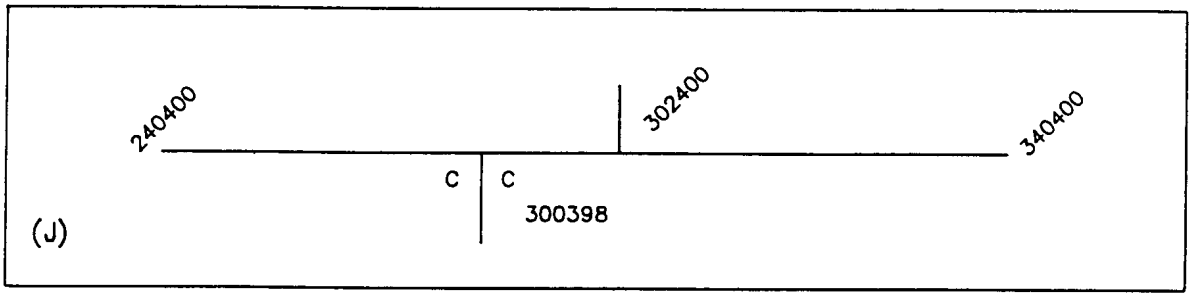

300440
17
16
300402
340400
240400
C
298400
C
20
21
300340
(E)

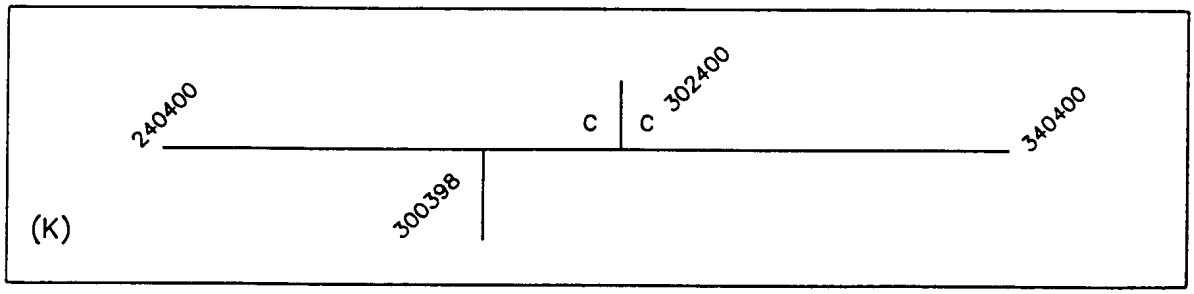

300440
17
16
C 302400
240400
C
340400
300398
20
21
300340
(F)

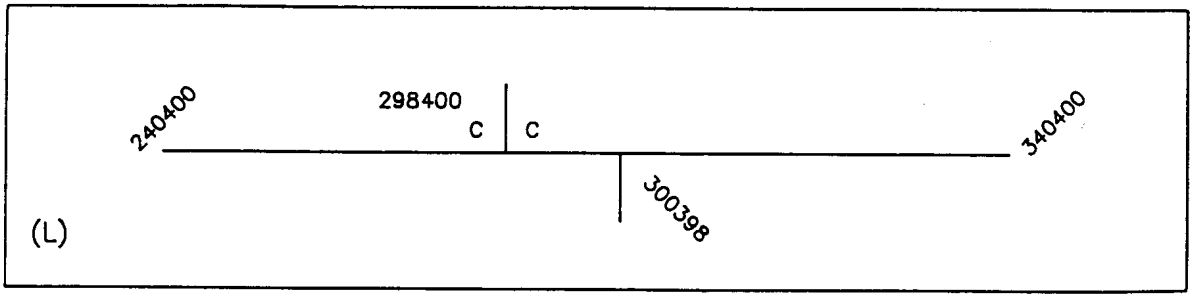

300440
17
16
240400
C
298400
C
340400
300398
20
21
300340
(G)

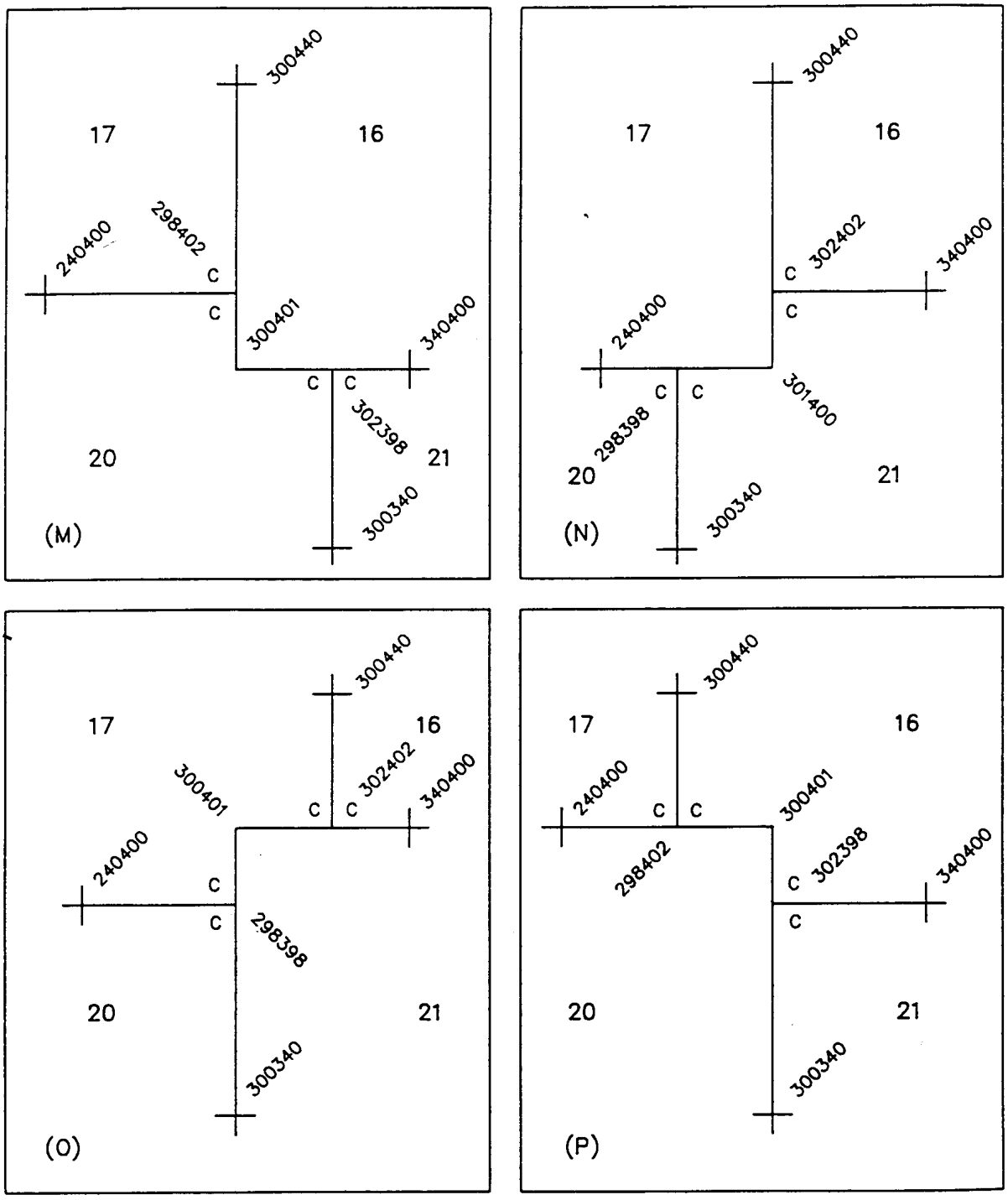

300440
17
16
240400
300402
C 302400
C
340400
20
21
300340
(H)

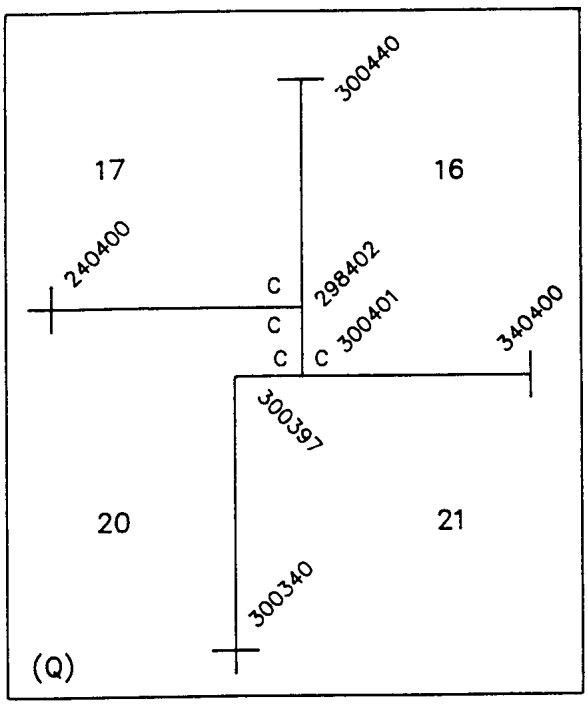

240400
298400
340400
C
C
300398
(I)


240400
302400
340400
C
C
300398
(J)


240400
C
C
302400
340400
300398
(K)


240400
298400
C
C
340400
300398
(L)


17
16
20
21
300440
240400
298402
300401
340400
302398
300340
(M)
17
16
20
21
300440
302402
340400
240400
301400
298398
300340
(N)
17
16
20
21
300440
300401
302402
340400
240400
298398
300340
(O)
17
16
20
21
300440
240400
300401
298402
302398
340400
300340
(P)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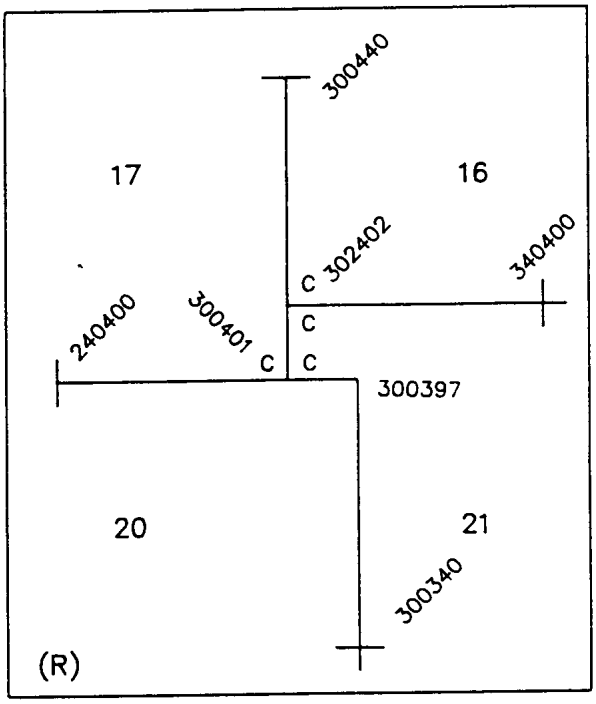
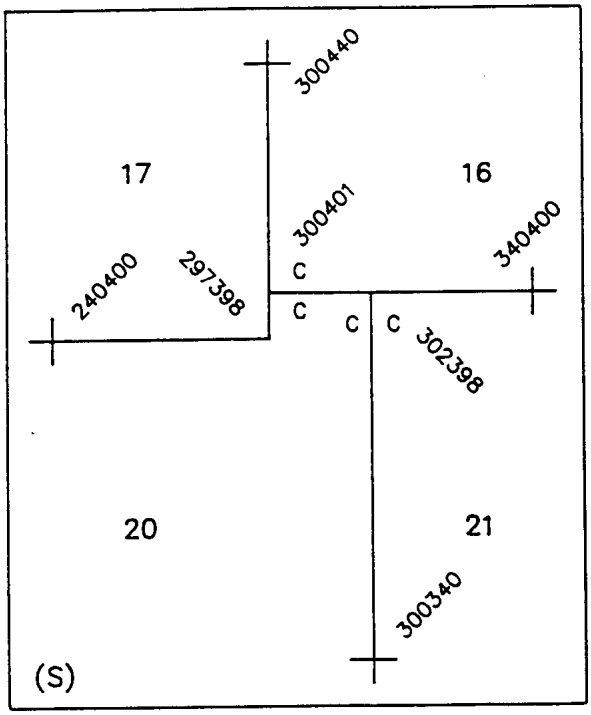
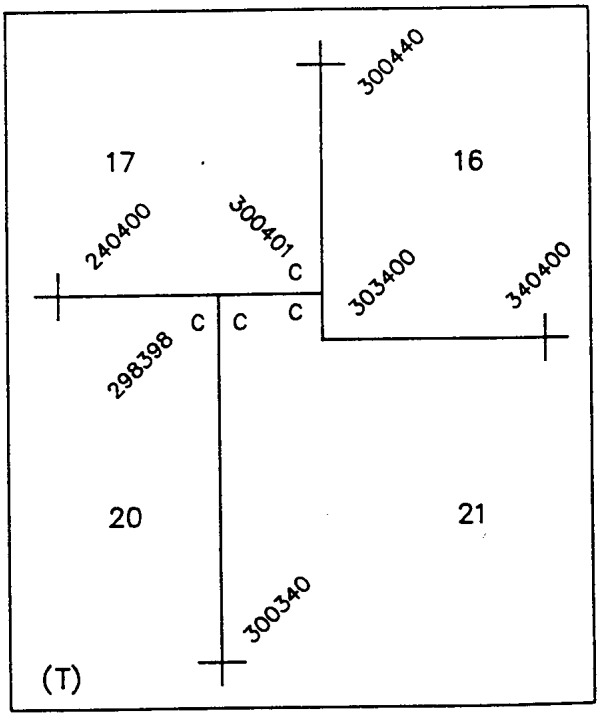
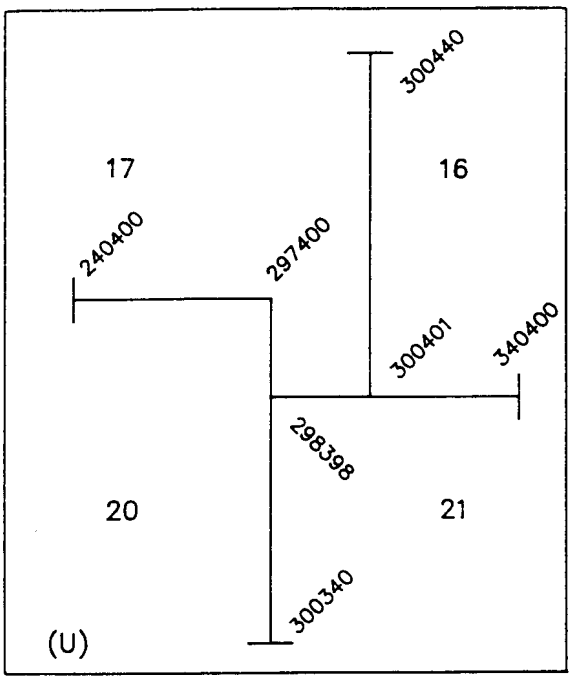
17
16
240400
298402
300401
340400
300397
20
21
300340
(Q)


300440
17
16
302402
340400
240400
300401
300397
20
21
300340
(R)


300440
17
16
300401
340400
240400
297398
302398
20
21
300340
(S)


300440
17
16
240400
300401
303400
340400
298398
20
21
300340
(T)


300440
17
16
240400
297400
300401
340400
298398
20
21
300340
(U)

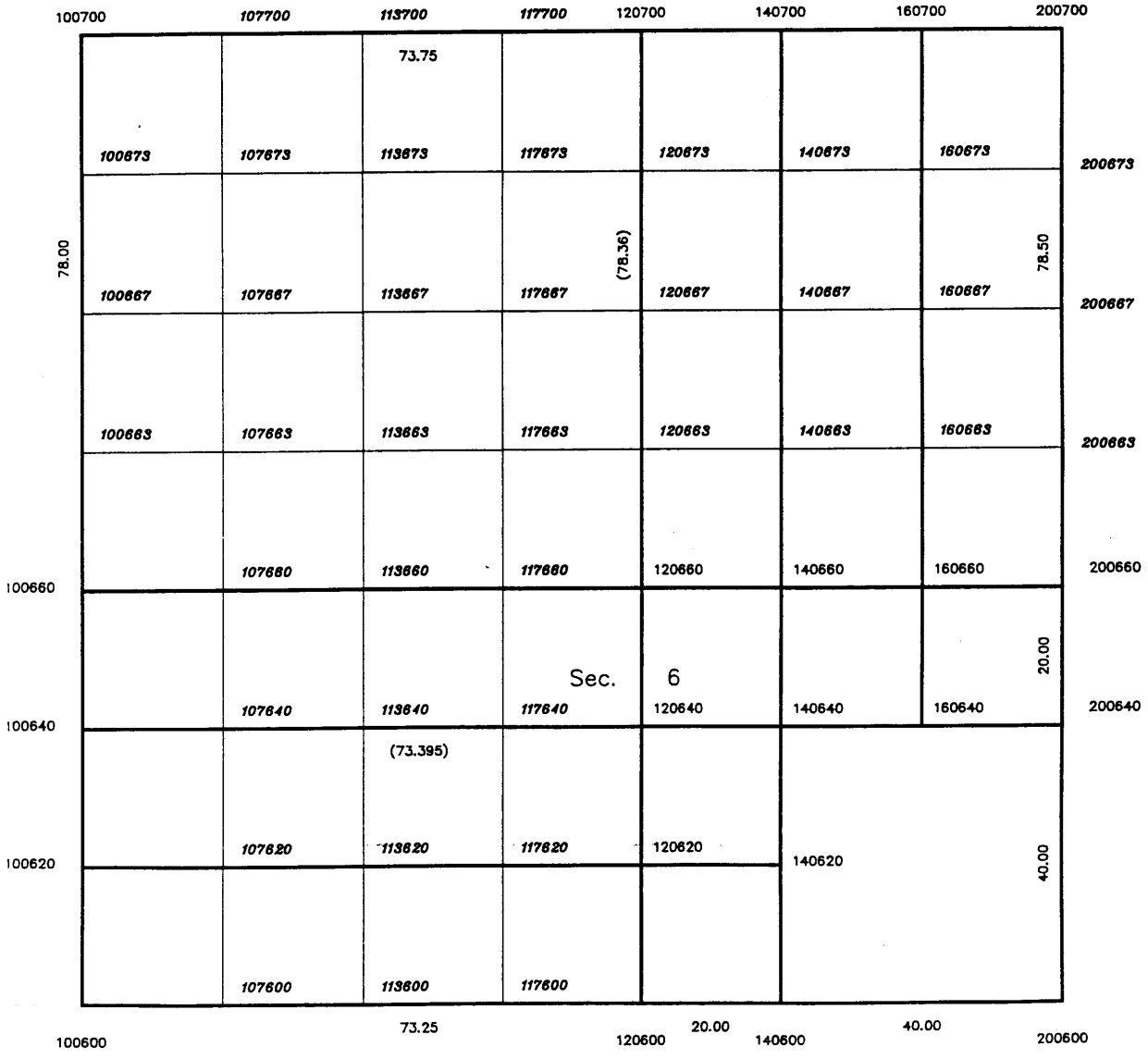
(V)

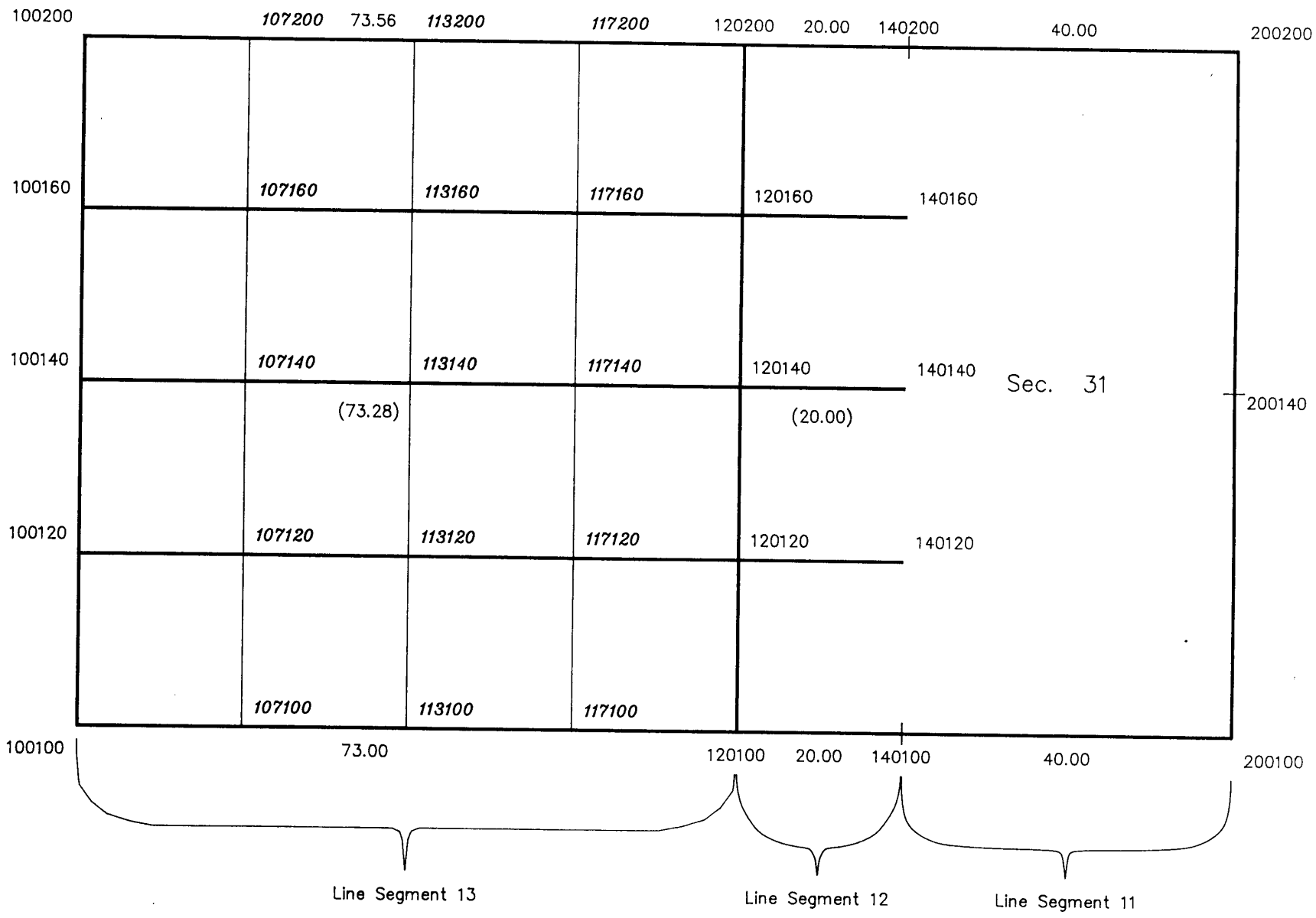
(W)

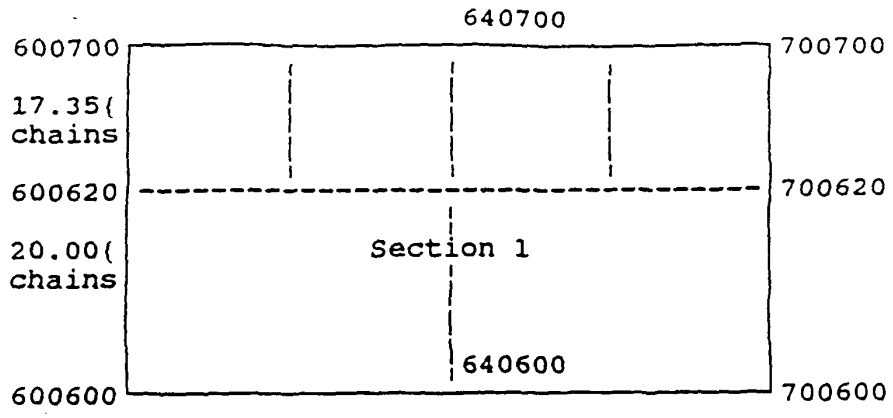
(X)

ELONGATED SECTIONS

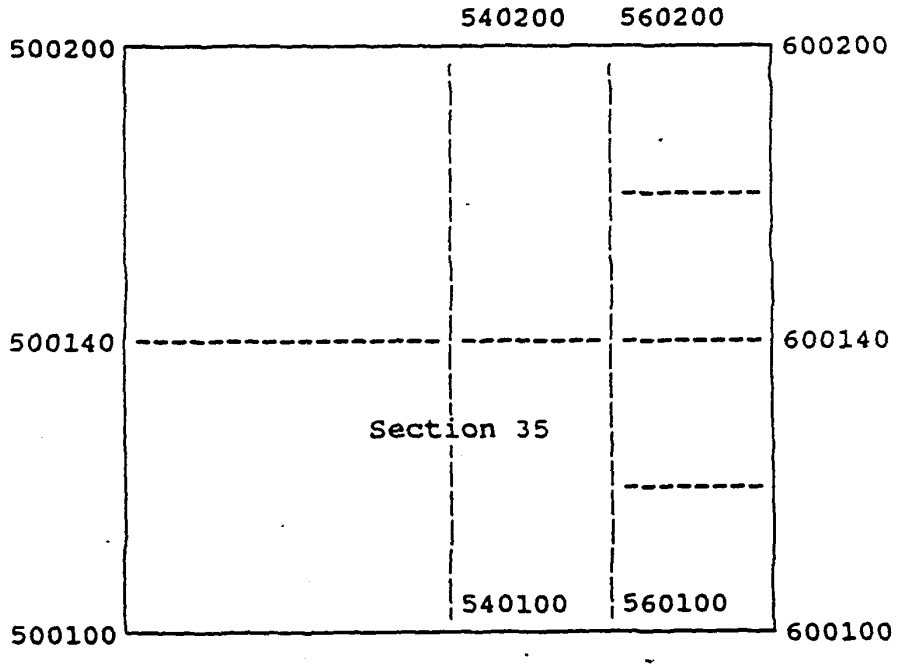
The attached sketches showing point identifier numbering for elongated sections are to be reviewed and, of course, are subject to change. The intent was to keep the method as simple as possible and to allow the maximum automatic processes to occur.


100700
107700
113700
117700
120700
140700
160700
200700
73.75
100673
107673
113673
117673
120673
140673
160673
200673
78.00
100667
107667
113667
117667
(78.36)
120667
140667
160667
78.50
200667
100663
107663
113663
117663
120663
140663
160663
200663
107660
113660
117660
120660
140660
160660
100660
200660
107640
113640
117640
Sec. 6
120640
140640
160640
20.00
100640
200640
(73.395)
107620
113620
117620
120620
140620
100620
40.00
107600
113600
117600
100600
73.25
120600
20.00
140600
40.00
200600


100200
107200
73.56
113200
117200
120200
20.00
140200
40.00
200200
100160
107160
113160
117160
120160
140160
100140
107140
113140
117140
120140
140140
Sec. 31
200140
(73.28)
(20.00)
100120
107120
113120
117120
120120
140120
107100
113100
117100
100100
73.00
120100
20.00
140100
40.00
200100
Line Segment 13
Line Segment 12
Line Segment 11



Shortened Section



Missing Section 36

SPECIAL SURVEY POINT IDENTIFIERS

The prefixes 703 to 999 are to be used for identifying special survey conditions such as Meanders,
Mineral surveys, Donation Land Claims (DLC), Homestead Entry Surveys (HES), Tracts, or any other metes and bounds type of surveys.

The Oregon State Office generally uses the 800 to 899 prefixes for most special surveys, DLC and Tract numbering on Cadastral Survey plats begin with the number 37 (continuing after section 36). We try to follow this scheme as strictly as we can, however, there are cases where there will be a DLC #37 and a Tract 37 in the same township, and of course there may be situations where there are miles and miles of river meanders, with 60 DLC's, and 10 Tracts, all in the same township. If you are uncertain which point ID'S are for which survey, a telephone call to this office can quickly clear it up.

The suffix portion of the Special Survey Point Identifiers will generally follow the existing corner
numbers on the plats of record, if they were numbered. If not, then we usually start at the most north-easterly corner of the survey and number consecutively clockwise around the survey, with the major angle points being numbered xxx0l0, xxx020, etc. The trailing 0 allows for additional points, such as intersections that define lots, to be added, at least up to the number 9 (xxx019).

In those townships where there are special surveys you will find that there are points with different point ID'S but having the same coordinate values. The duplications are necessary, at this point in time, to achieve the proper graphic depiction of the surveys of record.